CHAPTER 5. SYSTEMATIC STUDIES OF SEAWEEDS

A. Key to the identification of Seaweeds in the field:

Based on the morphological characters, the following seaweeds can be identified in the field itself.

Class: Chlorophyceae

*Eneromorpha clathrata*:

1. It is a green alga.
2. The plant body attached to substratum with the help of hold fast like structure.
3. Many uniseriate transparent narrow ribbon like branches develop from the same point.
4. Each branch is uniseriate.

*Enteromorpha intestinalis*:

1. The thallus attached to the rocky substratum.
2. The basal part is tapering and upper part is tubular, several such fronds develop from the base.
3. The plants are light green in colour.
**Ulva fasciata:**
1. The thallus attached to the substratum by the hold fast with rhizoidal outgrowth.
2. The lower part of the thallus is narrow and upper part is expanded and irregularly lobed or wavy.
3. The margin appeared in the form of ruffled.

**Ulva lactuca:**
1. The thallus attached to the substratum by the hold fast with rhizoidal outgrowth.
2. Thallus appear in the form of crinkled, expanded foliaceous with undulate margin.
3. The colour is yellowish, bright green.

**Ulva rigida:**
1. The thallus attached to the substratum with the help of hold fast.
2. The thallus is thick and rough appear in the form of rosettes.
3. The thallus is dark green in colour

**Chaetomorpha media:**
1. It is a green alga
2. The plant appear in the form of cylindrical, grass like
3. Attached to the hard rocky substratum
4. The alga grow perpendicular the substratum
5. It is dark green in colour
**Chaetomorpha tinum**:
1. It is delicate green alga commonly found in sandy area and also on rocks
2. It appears in the form of an elongated green or yellowish hair like structures
3. The tip becomes white after liberation of spores or gametes
4. The plant composed of elongated stiff, curled and cylindrical hair like structure

**Cladophora sarcenica**:
1. It is a green alga, commonly found on rocky area
2. Attached to the substratum with the help of holdfast like structure
3. Profusely branched and appear in the form of bunch

**Caulerpa peltata**:
1. It is a green alga
2. The plant body is differentiated in to stolon, rhizoids and flexible leafy branch.
3. The entire plant body is succulent.
4. The leaves peltate type.
**Caulerpa racemosa:**

1. The stolon is much branched, the branched stolon is densely entangled in old colonies.
2. The rhizoides bear branches.
3. The erect foliar branches are crowded on the stolon.
4. The foliar branches bear spherical and stalked branchlets, these branches appear in the form of bunch of grapes.

**Caulerpa scalpelliformis:**

1. The plant body is differentiated into flattened rhizome like stolon, rhizoides and leafy branch.
2. The plant is bright yellowish green to olive green in colour.
3. The flat rachis bears closely arranged glabrous glossy pinna.
4. The pinna arranged alternating with one another in a closed manner.

**Caulerpa sertularioides:**

1. The plant body is differentiated into fleshy and thick stolon, flat foliar branches are placed opposite to rhizoides.
2. The foliar branches bear closely placed pinna.
3. The pinna is cylindrical and curved upwards, the tip of pinna is rounded and ends with pointed structure.
4. It appears in the form of feather.
**Caulerpa texifolia:**

1. The plant body differentiated into naked stolon, rhizoides and leafy branch.
2. The stolon is not fleshy, it gives off rhizoides towards the substratum and leafy branches are placed opposite to rhizoides.
3. The leafy branch is feather like and it bears pinna, each pinna is curved upwards.
4. The entire feather like structure gradually narrow towards the tip.

**Codium elongatum:**

1. It is a green alga
2. Attached to the substratum with a help of disc like holdfast
3. The alga is dichotomously branched
4. The upper branches are broader with many hairs and spongy in texture

**Class: Phaeophyceae**

**Dictyota bartayresiana:**

1. It is a brown alga
2. Thallus attached to the substratum with irregularly lobed holdfast with rhizoides
3. Plant is dichotomously branched, the surface is rough to touch
4. Tips are forked and pointed and each branch is free from mid rib
Dictyota dichotoma:
1. It is a brown alga
2. Thallus attached to the substratum with a help of hard holdfast
3. Plant is dichotomously branched
4. Tip ends with 'V' shaped structure and it shows acute angle

Padina gymnospora:
1. It is a brown alga
2. Thallus attached to the substratum with a help of spongy pad like holdfast
3. The fronds appear in the form of rosette on the substratum, the upper surface is calcified and margin is in-rolled
4. The terminal rounded blade splits in to narrow slit
5. Lower part of blade bears small stalk like structure

Padina tetrastromatica:
1. It is a brown alga
2. Thallus attached to the substratum with a help of hard holdfast
3. Thallus splits longitudinally to form several small lobes called fronds
4. Dark lines are clearly visible in the form of concentric zones on the blades of the thallus
Spatoglossum asperum:
1. It is a brown alga
2. Thallus is attached to the substratum with the help of holdfast
3. Thallus is flat, palmet dichotomously divided into larger and smaller lobes
4. Entire plant appear in the form of bunch of ribbon shaped segment
5. The surface slightly calcified and dark brown in colour
6. The margins of the thallus bears larger and smaller finger like out growths.

Stoechospermum marginatum:
1. It is a brown alga
2. Attached to substratum with hard holdfast
3. Plant is dichotomously branched without mid rib
4. The tip of the branch is bifid
5. The fertile thallus bears two dark lines on the margins, these lines bears crowded sporangia

Sargassum cinerium:
1. It is a brown alga
2. The main axis of the plant is short and stout
3. The leaves are oblong, end with rounded apex with dentate margins
4. The leaves which present on the braches are lanceolate
5. The vesicles are obvate or rounded with mucronate apex
**Sargassum ilicifolium**:

1. It is a brown alga
2. The plant attached to the substratum with the help of holdfast
3. The leaves are elliptical in the upper part of the plant
4. The margins bear larger and smaller teeth and mid rib is present up to the length of \( rac{3}{4} \) of the leaf
5. Stalked globular vesicles are present

**Sargassum polycystum**:

1. It is a brown alga
2. Attached to the substratum with discoid holdfast
3. Plant is yellowish brown in colour
4. Leaf margin is serrate with a prominent mid rib to a short distance
5. Pedicillate spherical vesicles ends with spine like structure and vesicles are numerous, smaller in size

**Sargassum tenerrimum**:

1. It is a brown alga
2. Attached to the substratum with disc shaped hold fast
3. Plant is pyramidal in appearance
4. Leaves are yellowish brown in colour, the stem is delicate and cylindrical
5. Basal part of the leaf is broad and narrow towards tip, prominent mid rib is present, leaf margin is dentate
6. Stalked spherical shaped vesicles are present
**Sargassum wightii**:

1. It is a brown alga
2. Attached to the substratum with the help of holdfast
3. The plant is dark brown in colour
4. The upper part of the plant gives many branches
5. The leaves are tapering at both the ends
6. Stalked vesicles are larger in size ellipsoidal or spherical in shape
7. Receptacles are repeatedly branched, hence cluster of receptacles are present

Class: Rhodophyceae

**Porphyra vietnamensis**:

1. It is a red alga
2. Thallus is membranous, purple or pinkish purple, margin shows undulate and many bladelets developed from the base.
3. Thallus attached to the substratum with the help of rhizoid like structure.

**Gracilaria corticata**:

1. It is a red alga
2. The plant attached to the substratum with hold fast
3. The plant shows dichotomous branching, the branches are slightly flattened
4. The older plants bear numerous projections on the edge
5. Plant is purple to grass green in colour
Gracillaria foliifera:

1. It is a red alga
2. Thallus grow abundantly in shallow lagoons and submerged coral reefs.
3. Thallus attached to the substratum with a help of holdfast and it appears in the form of bushy because of profusely branched nature.

Gracillaria verruocosa:

1. It is a red alga
2. The plant attached to the substratum with hold fast
3. The plant is dichotomously branched with numerous lateral proliferations
4. The plant is fleshy, purplish or greenish translucent
5. The branch are tapering

Grateloupia lithophila:

1. It is a red alga
2. Thallus attached to the hard rocks
3. The flat thallus shows dense tufts and proliferation arising from upper end and by sides of frond.
**Amphiroa fragilissima**

1. It is a red alga  
2. Attached to the substratum with a hold fast like structures  
3. Fresh thallus have light purple colour  
4. The inter genicula are short and upper one is comparatively longer with multi axial condition.

**Cheilosporum spectabile**:

1. It is a red alga  
2. The thallus attached to the substratum with the help of rhizoids and it appears in the form of silver colour.  
3. The terminal end of the branches become forked.

**Hypnea muscifomis**:

1. It is a red alga  
2. Plant attached to the substratum by small discoid holdfast  
3. Thallus is a cartilaginous, reddish to purple colour and the thallus is erect  
4. Thallus is always covered with calcareous materials  
5. The plant appears in the form of pyramid

**Gelidiopsis intricata**:

1. It is a red alga  
2. Thallus attached to the substratum with the help of rhizoids.  
3. Thallus is greenish or purplish in colour  
4. The branches entangled and usually associated with other algae.
**Gelidiopsis variabilis**: 
1. It is a red alga 
2. Thallus attached to the substratum with the help of rhizoids. 
3. Thallus is greenish or purplish in colour. 
4. The free end of the each branch gives many branchlets. 

**Ceramium cruciatum**: 
1. It is a red alga 
2. Thallus attached to the substratum with the help of rhizoid like structure. 
3. Thallus is red or yellowish green in colour 
4. Plant body is filamentous, uniaxial, multicellular and richly branched with distinct bands.
B. Systematic and description of different Seaweeds

Classification, identification, nomenclature and description of different seaweeds encountered at different study stations during the present study period are discussed briefly in this section.

Class: Chlorophyceae

Class: Chlorophyceae
Order: Ulvales
Family: Ulvaceae
Genus: Enteromorpha
Species: clathrata.

Enteromorpha clathrata (Roth) Greville, 1830

Enteromorpha clathrata occurring in the littoral zones of the marine environment. Some species of Enteromorpha occur in fresh water, mangrove swamps, and estuaries where there is pollution.

The thallus attached to the substratum with holdfast like structure. The thallus is repeatedly branched in all directions. The branches measure about 15-20 cms long, the branches are soft, light green in colour. The cells are more or less Quadrangular the cells contain cup shaped chloroplast.

The species is available in Karwar particularly in the mangrove swamps of Kali river estuaries and Mavinahole creek and Tilmaathi (Majali) area.
Enteromorpha intestinalis - (Linnaeus) Nees, 1820

This algae is cosmopolitan in distribution commonly found in brackish water and sea-water. This algae is tolerant to salinity, hence found in such type of water. The thallus attached to the substratum with the help of a definite disc shaped holdfast cell. The thallus is usually gregarious or in groups of fronds and tapering below. Light green in colours. The chloroplast lies against the lower side of the cell. The thallus is tabular or cylindrical or flattened, unbranched, constricted at various locations and look like a sac as it is filled with gas. The length of the algae varies from 1-25 cm. Sexual reproduction observed by Scagel in (1960).

This algae is found in mangrove swamps, intertidal zone estuaries of Devbag, Mavinhole and in mangrove swamps of river Kali. This algae is used as food in raw condition it is edible, used as food for animals and also used as medicine.

Class: Chlorophyceae
Order: Ulvales
Family: Ulvaceae
Genus: Enteromorpha
Species: intestinalis

Enteromorpha fesciata

This algae is cosmopolitan in distribution commonly found in brackish water and sea-water. This algae is tolerant to salinity, hence found in such type of water. The thallus attached to the substratum with the help of a definite disc shaped holdfast cell. The thallus is usually gregarious or in groups of fronds and tapering below. Light green in colours. The chloroplast lies against the lower side of the cell. The thallus is tabular or cylindrical or flattened, unbranched, constricted at various locations and look like a sac as it is filled with gas. The length of the algae varies from 1-25 cm. Sexual reproduction observed by Scagel in (1960).

This algae is found in mangrove swamps, intertidal zone estuaries of Devbag, Mavinhole and in mangrove swamps of river Kali. This algae is used as food in raw condition it is edible, used as food for animals and also used as medicine.
Ulva fasciata Delile, 1813

The Ulva fasciata found attached to the rocks with the help of basal cells, in the intertidal zone, estuaries and mangroves swamps of tropical and sub tropical regions. The thallus measures about 1-50 cm. in length. Clean green in colour with undulate margins. In the sheltered localities the fronds are shorter. The Ulva is irregularly, lobed or pinnately divided into linear lobes.

Class: Chlorophyceae
Order: Ulvales
Family: Ulvaceae
Genus: Ulva
Species: lactuca

Ulva lactuca Linnaeus, 1753

Ulva lactuca found in subtidal and intertidal habitats in both rocky shore and sheltered bays. The thallus attached to the rocky substratum with the help of holdfast, the holdfast gives several Rhizoidal out growth from the lower surface of the cell.

The thallus is foliaceous bright green in colour or light green or yellowish green fronds and are delicate, large expanded sheets, it measures about 20 cm. in length with rattled, wavy and folded margin. In cross section the cells appear in the form of isodiametric or vertically elongated, with the help of gelatinous matrix. Each cell contains a single cup shaped chloroplast with single pyrenoid and unnucleate.
The *Ulva lactuca* & *U. fasciata* are used as food, animal feed and also as medicine. In Karwar, these algae are found in Tilmaathi rocky shore, Majali, Sunghiri, Kurmagad and Devgad islands.

Class: Chlorophyceae  
Order: Ulvales  
Family: Ulvaceae  
Genus: Ulva  
Species: rigida

*Ulva rigida* C. Agardh, 1823

This alga is found in the intertidal zone. It is an endangered species because this alga is rarely available in the sea water and it is on the verge of elimination. The alga is dark green in colour, irregularly lobed large sheets like structure, measures about 10-15 cm in diameter and 2-5 cm. in height. This algae attached to the rocks with the help of holdfast and spread on the rock in the form of rosettes. The cells are placed parallel to the surface of the thallus. These elongated cells are arranged in the form of palisade like.

In Karwar area one or two thallus are found around Kurmagad island, but in Bhatkal Rocky shore this algae is present.

The *Ulva rigida* used as food, animal feed and also used as a medicine.
Chaetomorpha media (C. Agardh) Kützing, 1847

This is distributed in the tropical waters of the world in the intertidal regions. The plant attached to the hard rocks and similar substrate with the help of stout and clavate basal cell. The plants growing well in sheltered places than in exposed area.

The plant appears in the form of bunch of grass. The plant body is filamentous several unbranched filaments develop from the same point, hence it appears like brush. The filament measures about 3-13 cm. in height. The filaments are dark green in colour, lateral filaments found near the holdfast are older filaments. Rhizoids are well developed, profusely branched and spread horizontally, branches end with irregularly shaped disc, because of this disc the plants are attached to the substratum.

In Karwar this algae available at Tilamaathi (Majali), Sunghiri and Kurmagad island on rocks. This alga is used as food, animal feed and also used in agricultural purposes.
Chaetomorpha linum (O.F. Muller) Kützing, 1845

This alga is one of the most delicate forms of green algae, found in the sea or brackish water’s in the littoral zone. This algae is free floating, sometimes attached to the substratum. The plant body is filamentous unbranched, cylindrical, frequently grow in groups of hundreds or thousands of individuals in sandy area around the tide pool or on rocks. Plants composed of loosely entangled, unattached, filamentous, bright green to yellowish green in colour. Sometimes the filaments are stiff curled cylindrical. The filaments usually measures about 5-30 cm in length. After liberation of spores, the tip of the filament is whitish in colour. Entangled filaments form a column which provides easily accessible and protected shelter for many fishes and other invertebrates.

In Karwar this algae is found in Devbag creek and Mavinahole estuaries.

This algae is used as a food, animal feed and also used in agricultural field.
Class: Chlorophyceae  
Order: Cladophorales  
Family: Cladophoraceae  
Genus: Cladophora  
Species: sercenica

*Cladophora sercenica* Borgesen, 1935

It is a green alga, commonly found on rocky area and is distributed in inter tidal zone. The plant body is attached to the substratum with the help of Rhizoids (holdfast like structure). Profusely branched and appear in the form of bunch. In Karwar, *Cladophora sercenica* is found in Karwar head, Devgad island, Kurmgad island, Sunghiri island and in Tilmaathi rocky shore.

This algae is used as food and also used as animal feed.
Caulerpa peltata J.V. Lamouroux, 1809

This algae distributed in intertidal zone. The plant body is attached to the substratum with the help of Rhizoids. The Stolons are freely branched.

The rhizoids develop towards lower surface of the stolon, opposite to stolon, the branchlets bears peltate type of leaves. The branchlets are slender and fleshy. The foliar branches are placed perpendicular to stolon. Each leaf is of peltate type, ends with disc.

In Karwar, *Caulerpa peltata* is found in Devgad, Kurmgad, Sunghiri islands and in Tilmaathi rocky shore.

This algae is used as food and also used as animal feed.

Caulerpa racemosa (Forsskal) J. Agardh, 1873

This algae distributed in intertidal zone. The plant body attached
to the substratum with the help of coarse branching stolons becoming very densely entangled in old colonies. The stout descending rhizoid bearing branches and crowded erect foliar branches are found on the upper surface of the stolons, spherical stalked branchlets are assimilators.

Each aerial branches appear in the form bunch of grapes. The assimilators of mature plants carry 1-5 pairs of pyriform vesicles.

In Karwar, this alga is found in Kamath beach rocky shore and Shankrubagh, Binaga rocky stretch. In addition to this, the alga is also found in Dhareshwara rocky stretch, Jali, Bhatkal & Honnavar.

It is used as food and also as animal feed.

Class: Chlorophyceae
Order: Caulerpales
Family: Caulerpaceae
Genus: Caulerpa
Species: scalpelliformis

Caulerpa scalpelliformis (R.Brown ex Turner) C. Agardh, 1817

This algae is distributed in intertidal zone. The plant body is attached to the substratum with the help of prostrate rhizome-like stolons. The root like structure develop from the lower surface of the rhizome-like stolon and leaf like branches above. The stolon is branched, glabrous glossy in appearance. The distinct stipe with two rows of flat leaf like assimilators are present, occasionally constricted at middle, upper end broadly rounded pinnately branched. The rachis are broad and flattened. It bears linear sub acute and compressed pinna.
In Karwar this algae is found in Karwar head, Binaga rocky stretch and also found in Shankrubagh area.

It is used as food and also used as animal feed.

Class: Chlorophyceae
Order: Caulerpales
Family: Caulerpaceae
Genus: Caulerpa
Species: sertularioides

Caulerpa sertularioides (S.G. Gmelin) M A Howe, 1905

This algae distributed in intertidal zone. Caulerpa sertularioides are colonial form attached to the substratum with the help of succulent stolons. The stolons give off stout rhizoids towards substratum opposite to rhizoids the pinnately compound leaf like rachis develop. Each branch bears cylindrical pinnules which are light green in colour. Each cylindrical pinnules curved upwards. The tip is rounded ends with spine like pointed structure (Mucronate). The pinna appear in the form of feather.

In Karwar this algae is found in Tilmaathi, and Sankrubagh area.

This algae is used as food and also as animal feed.
Class: Chlorophyceae  
Order: Caulerpales  
Family: Caulerpaceae  
Genus: Caulerpa  
Species: taxifolia  

*Caulerpa taxifolia* (Vahl) C. Agardh, 1817

This algae is distributed in the intertidal zone. The plant body is attached to the substratum with the help of rhizoids. The stolons spread irregularly on the rocky substratum. The stolon giving off rhizoid towards substratum and foliar branches above. The erect branches are very close to one another. Each branches bears pinna. These pinna are placed opposite to each other. The pinnules strongly compressed contracted at the base, tapering towards the tip and mucronate, the pinna is closely arranged.

In Karwar this algae is found in Sankrubagh, Binaga rocky shore and Karwar head.

It is used as food and also as animal feed.
This algae is distributed in the intertidal zone. The plant in the form of sponge. The plant body attached to the rocky substratum with the help of well developed disc like holdfast. The plant measures a height of about 10-30 cm. The plant is dichotomously branched, and branches are irregular, with abundant hairs. The end part of the branches are somewhat broader and upward, below the forked region, the thallus is broadened out cuneate.

In Karwar, the Codium is found at the extreme northern part of the Tilmaath (Majali) area.

It is used as food and also as animal feed and always compressed.
Class: Phaeophyceae

Class: Phaeophyceae
Order: Dictyotales
Family: Dictyotaceae
Genus: Dictyota
Species: bartayresiana

*Dictyota bartayresiana* Lamouroux, 1809

It is a brown alga, and the thallus attached to the substratum with irregular shaped hold fast with rhizoids. The plant is dichotomously branched. The surface is rough to touch. The tips are forked and pointed. Each branch is free from midrib.

Class: Phaeophyceae
Order: Dictyotales
Family: Dictyotaceae
Genus: Dictyota
Species: dichotoma

*Dictyota dichotoma* (Hudson) Lamouroux 1809

It is brown algae and the thallus attached to the substratum with the help of hard holdfast. The plant is dichotomously branched, the tip ends with “V” shaped structure and it shows acute angle (15-45 degree).

In Karwar, it is abundantly available in Tilmaathi, Sankrubag coast and Devgad & Kurmagad islands.
Class: Phaeophyceae
Order: Dictyotales
Family: Dictyotaceae
Genus: Padina
Species: tetrastromatica

Padina tetrastromatica  Hauck 1887.

It is a brown alga commonly distributed in the lower half of the intertidal zone. It attaches to stones with the help of pad like holdfast. The thallus is dioecious. The plants are tufted, measures about 5-10 cm tall, the blades measures about 5-20 cm broad and the upper part is broad and rounded with narrow split portions. The lower part is stalk like stupose. The upper surface of thallus is moderately calcified. The fertile and sterile zones are arranged alternatively in the thallus.

In Karwar, this alga is found in the Tilmaathi coast. This alga is used as manuare in the coastal areas.
It is a brown alga, and the thallus attached to the substratum with the help of hard hold fast. The thallus splits longitudinally to form several small lobes called fronds. Dark lines are clearly visible in the form of concentric zones on the blades of thallus.

Class: Phaeophyceae
Order: Dictyotales
Family: Dictyotaceae
Genus: Spatoglossum
Species: asperum

*Spatoglossum asperum* J. Agardh, 1894

The thallus attached to the substratum with the help of holdfast and is flat, palmate dichotomously divided into larger and smaller lobes. The entire plant appear in the form of bunch of ribbon shaped segments, is slightly calcified and dark brown in colour. The margin of the thallus bears larger and smaller finger like outer growths.

Class: Phaeophyceae
Order: Dictyotales
Family: Dictyotaceae
Genus: Stoechospermum
Species: marginatum

*Stoechospermum marginatum* (C. Agardh) Kützing 1843
It is a brown alga, is attached to the substratum with hard holdfast and is dichotomously branched without midrib. The tip of the branch is bifid or truncate. The fertile plants bears two dark lines on the margins and these line bears crowded sporangia.

Class: Phaeophyceae  
Order: Fucales  
Family: Sargassaceae  
Genus: Sargassum  
Species: cinereum

*Sargassum cinereum* (J.Agardh), 1848

It is a brown alga, the main axis of the plant is short and stout. The leaves are oblong ends with rounded apex, with dentate margins. The leaves which are present on the branch lets are lanceolate. The vesicles are obovate or rounded with mucronate apex.

Class: Phaeophyceae  
Order: Fucales  
Family: Sargassaceae  
Genus: Sargassum  
Species: ilicifolium

*Sargassum ilicifolium* (Turner) C.Agardh, 1820
It is a brown algae and the plant attached to the substratum with the help of holdfast. The leaves are elliptical in the upper part of the plant. The margin bears larger and smaller teeth like projections and midrib is present up to the length of 75% of leaf. Staked globular vesicles are present.

Class: Phaeophyceae
Order: Fucales
Family: Sargassaceae
Genus: Sargassum
Species: polycystum

*Sargassum polycystum* C. Agardh, 1824

It is a brown alga, attached to the substratum with discoid holdfast. The plant is yellowish brown in colour. The leaf margin is serrate with prominent midrib to a short distance. Creptostomatas are scattered on the surface of the blade, vesicles are numerous but smaller in size. Pedicellate spherical vesicles ends with spine like structure and the plant is purple to grass green in colour.

Class: Phaeophyceae
Order: Fucales
Family: Sargassaceae
Genus: Sargassum
Species: tenerrum

*Sargassum tenerrum* J. Agardh, 1848

It is a brown alga attached to substratum with disc shaped holdfast. Plant is pyramidal in appearance and leaves are yellowish-brown in colour.
The stem is delicate and rounded. The basal part of the leaf is broader and narrower towards tip, permanent midrib is present, leaf margin is dentate. Stalked spherical shaped vesicles are present.

Class: Phaeophyceae
Order: Fucales
Family: Sargassaceae
Genus: Sargassum
Species: wightii

*Sargassum wightii* Greville, 1848

It is a brown alga, attached to the substratum with holdfast. The plant is dark brown in colour. Upper part of the plant gives many branches. The leaves are tapering at both the ends (base & apex), Stalked vesicles are larger in size, ellipsoidal or spherical in shape. Receptacles are separately branched hence the presence of cluster of receptacles is the characteristic features of this species.
Class: Rhodophyceae

Class: Rhodophyceae
Order: Bangiales
Family: Bangiaceae
Genus: Porphyra
Species: vietnamensis

*Porphyra vietnamensis* T. Tanaka & Pham-Hoàng Hồ, 1962

The thallus is membranous, purple or pinkish purple, commonly found on granite rocks. The thallus attached to the rocks with a help of rhizoikd like holdfast. Several bladelets developed from the base of the thallus, the thallus is delicate and transparent. This thallus found in upper inter-tidal rocks of Karwar coast and also found in Honnavar and Bhatkal coastal area.

Class: Rhodophyceae
Order: Gracilariales
Family: Gracilariaceae
Genus: Gracilaria
Species: corticata

*Gracilaria corticata* (J. Agardh) J. Agardh, 1852

This alga is distributed in Intertidal zone Gracilaria corticata is attached to the rocks with the help of holdfast. The plants are fleshy and slender the plant shows dichotomous branching. The plant measures about
10-15 cm in height. The thallus consists of many flattened much divided blades. In older thallus, numerous projections are present on the margin of the segments in a pinnate type. The colour of the thallus is vary from deep purple to grass green.

It can be used for Agar production & also used as food and animal feed.

In Karwar the algae is found in Majali and Tilamaathi rockyshore.

Class : Rhodophyceae
Order : Gracilariales
Family : Gracilariaceae
Genus : Gracilaria
Species : foliifera

**Gracilaria foliifera** (Forsskal) Borgesen, 1932

The thallus is bushy and profusely branched, the tip of the thallus ends with forked branch. The branches are delicate and smooth. It shows shady purple or faded purple. The thallus measures about 10-30cm height attached to the rocky substratum with the help of holdfast like structure. This species available in the Karwar coast, this thallus abundantly found in shallow lagoons.

Class : Rhodophyceae
Order : Gracilariales
Family : Gracilariaceae
Genus : Gracilaria
Species : verrucosa.
Gracilaria verrucosa (Hudson) Papefuss

It is a common red algae distributed throughout the temperate and tropical seas. Usually growing in shallow lagoons and bays especially where high inflow of fresh water with maximum nutrients are available. The Algae attached to the substratum with the help of disc shaped holdfast. The branches are free and develop from the point of attachment. The thallus is red to wine red in colour. The thallus grows up to 40 cm. in height. The plant body is bushy and branches are usually alternate, fronds are cartilaginous and somewhat slippery to touch.

It is used as vegetable, salad and also used as a animal feed. It is used as raw material for agar manufacture.

In Karwar, it is found in northern part of Tilamaathi and Majali rocky shore.

Class: Rhodophyceae
Order: Cryptonemiales
Family: Corynomorphaceae
Genus: Grateloupia
Species: lithophila

Grateloupia lithophila Borgesen, 1938

The thallus is attached to the harad rocky substratum with a help of holdfast like structure. The thallus is flat ribbon like, the middle portion is slightly broad and both ends are gradually narrow, linear lanceolate. The
proliferation arising from the sides and upper end of the thallus. The thallus is irregularly divided, the length of the thallus measures about 10-15 cm and 0.5 to 2.5 cm in diameter. This alga found in inter tidal zone of Karwar coast. In addition to Karwar coast, the alga also found in Honnavar and Bhatkal coastal area.

Class : Rhodophyceae
Order : Gracilariales
Family : Gracilariaceae
Genus : Amphiroa
Species : fragilissima

*Amphiroa fragilissima* (Linnaeus) Lamouroux, 1816

It is a red alga attached to the substratum with holdfast. The plants are found in lower mid-littoral zone and the plant shows multi-axial and it is articulated. The plant shows dichotomous branching with purple colour.

The thallus is found in the lower mid-littoral zone and presumably the thallus are found is sheltered areas. The thallus is articulate attaining a height of 4-6 cm. The thallus is multiaxial intermixed with long and short cells in the Intergenicular region. The fresh specimens have a light purple colour and dichotomously branched the lower genicula are prominent and brownish. The apical region is covered by a single layer of cover cells because the apical region consists of meristematic cells. The branches of filaments are spread in the form of fan like.

In Karwar, this alga is found in the Tilamaathi and Majali area, Sankrughag, Bhatkal and Honnavar rocky shore.
Class: Rhodophyceae
Order: Cryptonemiales
Family: Corallinaceae
Genus: Cheilosporum
Species: spectabile

*Cheilosporum spectabile* Harvey ex Grunow, 1874

The thallus is attached to the substratum with a help of rhizoid like structure. The thallus appear in the form of silver colour, many branches develops from the basal part of the thallus. The free end of the thallus shows forked conditions. This alga is found in the intertidal zone of Karwar coast and also found in the Honnavar and Bhatkal coast.

Class: Rhodophyceae
Order: Gracilariales
Family: Gracilariaceae
Genus: Hypnea
Species: musciformis.

*Hypnea musciformis* (Wulfen) Lamouroux, 1813

It is a red alga, the plant attached to the substratum by small discoidal holdfast. Thallus is cartilaginous, reddish to purple colour and is erect. The thallus is always covered with calcareous material.

This alga is distributed in intertidal zone and very common in warm water seas found growing on rocks, dead corals and shells of shallow and sheltered areas. Thallus is fleshy measures about 8-10 cm in length and the
colour of the thallus is greenish to straw when it is in fresh condition and turns brown in colour when it is dry. The branches developing irregularly from all sides of the body, branch-lets are spurlike. The plant appear in the form of pyramid.

This alga provides raw material for carrageenan. This alga is abundantly used as food and as an animal feed.

In Karwar it is found in northern part of Thilamaathi and Majali area.

Class: Rhodophyceae
Order: Rhodymeniales
Family: Rhodymenaceae
Genus: Gelidiopsis
Species: intricata

Gelidiopsis intricata (C.Agardh) Vickers, 1905

The thallus attached to the substratum with the help of rhizoids, it appears in the form of bush. The fresh thallus is greenish or purplish in colour. The thallus is dichotomously branched, the lower braches are somewhat creepy and entangled but the upper branches are erect and cylindrical and tapering towards the apices. This alga is found in the inter tidal zone of Karwar coast.
Class: Rhodophyceae
Order: Rhodymeniales
Family: Rhodymenaceae
Genus: Gelidiopsis
Species: variabilis

*Gelidiopsis variabilis* (J. Agardh) Schmitz, 1895

Thallus attached to the substratum with the help of rhizoids. The fresh thallus is greenish or purplish in colour. The free end of the each branch gives many branchlets. The branches are cylindrical and more or less uniform. This alga is found in the inter tidal zone of Karwar coast.

Class: Rhodophyceae
Order: Ceramiales
Family: Ceramiaceae
Genus: Ceramium
Species: cruciatum

*Ceramium cruciatum* Collins & Hervey, 1917

It is a red alga attached to the substratum with a help of rhizoidal like structure. The thallus is red or yellowish-green or reddishbrown in colour. The plant body is filamentous, uniaxial, multicellular and richly branched showing distinct bands. The banded appearance of the main filament is due to envelope of cortical cells cut off by the axial cells. The cortical cells are produced discontinuously. This results in alternation of corticated and non-
corticated regions. The spermatangia (antheridia) are present in clusters on the upper side of the lateral branchlets. The carpogonium is born on the tip of the short lateral branches.

In Karwar, this alga is found in Majali and Tilmaathi coastal areas.

Table 23 explains the list of Seaweed species occurred at different study stations during the present investigation tenure. Totally 36 species were identified and are belongs to three classes namely, Chlorophyceae, Phaeophyceae and Rhodophyceae.
Table 23. Check list of Seaweed species encountered at different study site during the present study period.

<table>
<thead>
<tr>
<th>Species</th>
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<tbody>
<tr>
<td>Enteromorpha clathrata</td>
</tr>
<tr>
<td>E. intestinalis</td>
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<tr>
<td>Ulva fasciata</td>
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<tr>
<td>U. lactuca</td>
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<tr>
<td>U. rigida</td>
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<tr>
<td>Chaetomorpha media</td>
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<tr>
<td>C. linum</td>
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<tr>
<td>Cladophora sercenica</td>
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<tr>
<td>Caulerpa peltata</td>
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<tr>
<td>C. racemosa</td>
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<tr>
<td>C. scalpelliformis</td>
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<tr>
<td>C. sertuloides</td>
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<tr>
<td>C. taxifolia</td>
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<tr>
<td>Codium elongatum</td>
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<tr>
<td>Dictyota bartayresiana</td>
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<tr>
<td>D. dichotoma</td>
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<tr>
<td>Padina gymnospora</td>
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<tr>
<td>P. tetrastromatica</td>
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<tr>
<td>Spatoglossum asperum</td>
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<tr>
<td>Stoechospermum marginatum</td>
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<tr>
<td>Sargassum cinerium</td>
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<tr>
<td>S. ilicifolium</td>
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<tr>
<td>S. polycystum</td>
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<tr>
<td>S. tenerimimum</td>
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<tr>
<td>S. wightii</td>
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<tr>
<td>Porphyra vietnamensis</td>
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<tr>
<td>Gracilaria corticata</td>
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<tr>
<td>G. foliifera</td>
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<tr>
<td>G. verrucosa</td>
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<tr>
<td>Grateloupio lithophila</td>
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<tr>
<td>Amphiroa fragilissima</td>
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<tr>
<td>Chelosporum spectabile</td>
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<tr>
<td>Hypnea musciformis</td>
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<tr>
<td>Gelidiopsis intricata</td>
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<tr>
<td>G. variabilis</td>
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<tr>
<td>Ceramium cruciatum</td>
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</tbody>
</table>